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FORM PTO-1390 (Modified) (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **991.1145**

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR): **09/701122**

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FI99/00421	**May 17, 1999**	**May 20, 1998**

TITLE OF INVENTION

EQUIPMENT AND METHOD OF MEASUREMENT IN VEHICLE BODY ALIGNMENT WORK IN VEHICLE BODY MEASUREMENT

APPLICANT(S) FOR DO/EO/US

Teuvo Olavi VENALAINEN

NOV 20 2000

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Letter Re Priority

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/701122	PCT/FI99/00421	991.1145

21. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☒	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO	$970.00
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	$840.00
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$690.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$670.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT = $1,000.00

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). $0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	18 - 20 =	0	x $18.00	$0.00
Independent claims	3 - 3 =	0	x $80.00	$0.00
Multiple Dependent Claims **(check if applicable)**.		☐		$0.00

TOTAL OF ABOVE CALCULATIONS = $1,000.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable)**. ☐ $0.00

SUBTOTAL = $1,000.00

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). + $0.00

TOTAL NATIONAL FEE = $1,000.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☒ $40.00

TOTAL FEES ENCLOSED = $1,040.00

Amount to be: refunded	$
charged	$

☒ A check in the amount of **$1,040.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **50-0518** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

STEINBERG & RASKIN, P.C.
1140 Avenue of the Americas, 15th Floor
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By Paul J. Higgins
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SIGNATURE

Martin G. Raskin

NAME

25,642

REGISTRATION NUMBER

November 20, 2000

DATE

UNITED STATES PATENT AND TRADEMARK OFFICE

Re:	Application of:	Teuvo Olavi VENÄLÄINEN
	Serial No.:	Not yet known
	Filed:	Simultaneously
	For:	**EQUIPMENT AND METHOD OF MEASUREMENT IN VEHICLE BODY ALIGNMENT WORK IN VEHICLE BODY MEASUREMENT**

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

November 20, 2000

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Please amend the specification as follows (reference is to the lines as numbered).

Page 1, line 6, insert --**FIELD OF THE INVENTION**--;

Page 1, line 7, after "The" insert --present--; and

Page 1, line 9, insert --**OBJECTS AND SUMMARY OF THE INVENTION**--.

Page 3, line 6, insert --**BRIEF DESCRIPTION OF THE DRAWINGS**--;

line 12, after "side" insert --elevational--; and

line 31, change "64" to --65--.

Page 4, line 4, change "a so-called" to --an--;

line 19 insert --**DETAILED DESCRIPTION OF THE INVENTION**--.

Page 5, line 10, after "can be placed." insert --(As seen in Fig. 2B)--.

Page 7, line 14, change "64" to --65--;

line 15, change "64" to --65--;

line 24, after "arm 40." insert --(As seen in Fig. 3B)--; and

line 32, change "64" to --65--.

Page 8, line 8, change "64" to --65--;

line 18, change "42a" to --54--; and

lines 18-19, change "The arm part 43" to --A second arm part 43--.

Page 12, after line 25, insert the following:

-- The invention is described above referring merely to the advantageous embodiment examples thereof, to the details of which the invention is not, however, intended to be exclusively restricted. A number of modifications and variations are conceivable within the scope of the inventive idea of the claims below. As such, the examples provided above are not meant to be exclusive and many other variations of the present invention would be obvious to those skilled in the art, and are contemplated to be within the scope of the appended claims.--

IN THE CLAIMS:

Please amend the claims as follows.

1. (Amended) A measurement apparatus for vehicle body alignment work, which measurement apparatus [can be placed] is used in connection with an alignment table (10) to whose fastenings ($11a_1$, $11a_2$, $11a_3$, $11a_4$) the vehicle is attached for the time of the alignment work, and a measurement unit ($17a_1$, $17a_2$) of which measurement apparatus (15) can be moved in a vertical guide ($15b_1$,$15b_2$), which vertical guide ($15b_1$,$15b_2$) can further be moved in a longitudinal guide ($15a_1$, $15a_2$), and which measurement unit ($17a_1$) [can be] is provided with a movable measurement arm (40), [characterized in that] wherein the measurement arm (40) comprises an articulation (41) to which a first arm part (42) is connected such that the first arm part (42) [can be] is pivoted on support of the articulation (41) with respect to the measurement arm (40), and that to the first arm part (42) is connected a second arm part (43) which [can be] is turned around its longitudinal axis (X_{30}), to which second arm part (43) a measurement head (65) is connected either directly or through an intermediate part.

2. (Amended) A measurement apparatus for vehicle body alignment work as claimed in claim 1, [characterized in that] further comprising:

a second structure formed by the first and second arm parts (42,43) which can be extended in the direction of [the] a longitudinal axis (X_{20}) of the first arm part (42) such that the second arm part (43) can be displaced with respect to the first arm part (42) to different length positions.

3. (Amended) A measurement apparatus as claimed in [any one of the preceding claims, characterized in that] claim 1, wherein the second arm part (43) comprises [at its end] a through hole (64) formed at an end thereof through which the measurement head (65) is passed perpendicularly to the longitudinal axis (X_{30}) of the second arm part.

4. A measurement apparatus as claimed in [any one of the preceding claims, characterized in that] claim 1, wherein the articulation (41) at the end of the measurement arm (40) further comprises a sleeve part (44), a backing body (48) being pivotable with respect to the sleeve part (44) to alternative angular positions such that the backing body (48) comprises at its end face (48b) holes ($49a_1$,$49a_2$...), and that the sleeve (44) placed against [it] said backing body (48) comprises at its end face (44b) holes ($45a_1$,$45a_2$,$45a_3$), into which balls ($46a_1$,$46a_2$ ...) are positioned in locking positions, and that the balls ($46a_1$,$46a_2$) [and springs ($47a_1$,$47a_2$) pressing the balls are] placed into the holes ($49a_1$,$49a_2$ ...) of the backing body (48) and are pressed into the holes by springs ($47a_1$,$47a_2$), the backing body (48) being pivotable to a desired angular position/locking position according to the spacing determined by the angular distance between the holes, and that the arm part (42) associated with the backing body (48) can be turned in a horizontal plane with respect to the measurement arm (40).

5. (Amended) A measurement apparatus as claimed in [any one of the preceding claims, characterized in that] claim 1, wherein the first arm part (42) further comprises at [its] both its ends, holes ($55a'_1$, $55a_1$; $55a'_2$,$55a_2$... $56a'_1$,$56a_1$;$56a'_2$,$56a_2$ ...), in which connection springs ($61a_1$, $61a_2$,...) and balls ($62a_1$,$62a_2$) situated in holes ($60a'_1$,$60a_1$; $60a'_2$,$60a_2$) of the second

arm part (43) can be brought alternatively either into the holes ($55a'_1$,$55a_1$,...) of one end of the first arm part (42) or into the holes ($56a'_1$,$56a_1$, ...) of the other end thereof, in which connection the balls ($62a_1$,$62a_2$ ...) can be turned through a desired angular spacing and they will be positioned alternatively in the holes ($55a'_1$,$55a_1$,... or $56a'_1$,$56a_1$,... of the first arm part (42) in locking positions.

6. (Amended) A measurement apparatus as claimed in [any one of the preceding claims, characterized in that] claim 1, wherein the second arm part (43) further comprises an end piece (700) and therein a through hole (64) for the measurement head (65), and that the measurement head (65) comprises grooves ($66a_1$,$66a_2$), in which connection the measurement head (65) can be placed in alternative positions, the end piece (700) comprising an end stub (67) into whose inner hole (68) a ball (69) and a spring (70) are placed, a screw (71) pressing the ball (69) into one of the grooves ($66a_1$, or $66a_2$..) defined by the locking position of the measurement head (65).

7. (Amended) A measurement apparatus as claimed in [any one of the preceding claims, characterized in that] claim 1, wherein the second arm part (43) further comprises an end sleeve (600), made of plastic, at the end on the side of the first arm part (42), which end sleeve is attached by means of a cotter (63) to a metal portion (430) of the second arm part (43), [and that the holes ($60a_1$, $60a'_1$,$60a_2$,$60a'_2$) have been made into the end sleeve (600) made of plastic, thereby] enabling good bearing properties for the balls ($62a_1$,$62a'_1$...).

8. (Amended) A measurement apparatus as claimed in [any one of the preceding claims, characterized in that] claim 1, wherein the first arm part (42) further comprises end threads (57) at its end, onto which threads a nut (59) [can be] is mounted, so that by means of a tension sleeve (58) situated between the nut (59) and the second arm part (43), the second arm part (43) can be locked to different positions with respect to the first arm part (42), the tension sleeve (58) being split in a longitudinal direction, thereby serving as a tension washer when the nut (50) tightens it against the arm part (43), the thread (57) being a taper thread.

9. (Amended) A method in vehicle body alignment work in the measurement of a vehicle body, which method employs a measurement apparatus (15) which is connected to an alignment table, and which comprises longitudinal guides ($15a_1$,$15a_2$) extending parallel to the longitudinal axis (X) of the vehicle as well as vertical guides ($15b_1$,$15b_2$), the vertical guides ($15b_1$,$15b_2$) moving in the longitudinal guides ($15a_1$,$15a_2$) and comprising a measurement unit ($17a_1$,$17a_2$) which can be moved in the vertical guides ($15b_1$,$15b_2$), and that the measurement unit ($17a_1$,$17a_2$) is provided with a movable measurement arm (40) which can be moved in a horizontal direction with respect to the measurement unit ($17a_1$), [characterized in that the] the method comprising the step of:

providing a measurement apparatus [used is such that it] wherein said measurement apparatus comprises at the end of the measurement arm (40) a movable first arm part (42) which moves in a horizontal plane, and that a second arm part (43) having a longitudinal axis (X_{30}) is connected to said first arm part (42) which can be moved and positioned in a horizontal plane, said second arm part (43) being rotatable around its longitudinal axis (X30), and that a

measurement head (64) is connected to the second arm part (43), whereby, by using the arrangement in accordance with the invention, the measurement locations situated inside the vehicle body (A) can also be measured by the same measurement head (64).

10. (Amended) A method as claimed in claim 9, [characterized in that, in the method,] wherein the combination of locking positions of each arm part (42,43) and the measurement head (64) connected to the measurement arm (40) is read and fed into the memory of a computer or said combination is detected electrically by using position detectors which indicate the pivot position of the first arm part (42), the rotation position of the second arm part (43) connected to the first arm part (42) and the linear position of the measurement head (64) connected to the second arm part (43), and that, based on said data fed or directly electrically detected, the result of measurement is at least one of being directly indicated on [the] a display of [the] a computer or equivalent [and/]or said measurement result is printed as a measurement record.

Please add the following new claims:

--11. A measurement apparatus for use in vehicle body alignment work when a vehicle to be aligned is in place on an alignment table and attached thereto by means of fastenings, said apparatus comprising:

a measurement unit structured and arranged to be movable within a vertical guide, wherein said vertical guide is structured and arranged to be movable within a longitudinal guide; said measurement unit having a movable measurement arm comprising a first arm part, having a first

arm part longitudinal axis, pivotally connected to said measurement arm via an articulation at a first end of said first arm part, and a second arm part slidably insertable within said first arm part, having a second arm part longitudinal axis, operatively connected at a second end to said first arm part, wherein said connection between said first arm part and said second arm part is such that said second arm part is rotatable about said second arm part longitudinal axis; and

a measurement head operatively coupled to a second end of said second arm part.

12. The measurement apparatus according to claim 1, wherein said second arm part is structured and arranged to be slidably adjustable with respect to said first arm part longitudinal axis to different selected axial positions.

13. The measurement apparatus according to claim 1, wherein said second arm part further comprises:

a measurement through hole formed at said second end thereof for receiving said measurement head therethrough; said through hole being structured and arranged such that when said measurement head is displaced therein, said measurement head is perpendicularly aligned with respect to said second arm part longitudinal axis.

14. The measurement apparatus according to claim 1, wherein said articulation further comprises:

a sleeve part connected to an end of said measurement arm and being perpendicular to said first arm longitudinal axis and having a top surface and a bottom surface, said bottom surface

being provided with a plurality of holes for receiving a ball therein; and

a backing body formed at said first end of said first arm part having a top face structured and arranged to abut said bottom surface of said sleeve part, said top face being provided with a plurality of holes for cooperating with said holes formed in said bottom surface of said sleeve part, said holes in said top surface of said backing body being structured and arranged to receive a plurality of compression springs therein, such that when said backing body is aligned and coupled with said sleeve part, said springs press said balls into said holes on said bottom surface of said sleeve part and are retained therein; whereby said first arm part is pivotably about a horizontal plane with respect to said measurement arm.

15. The measurement apparatus according to claim 11, further comprising:

a plurality of through holes formed at said first end and said second end of said first arm part; and

through holes formed in said first end of said second arm part structured and arranged for receiving springs therein and balls placed atop said springs, whereby when said second arm part is inserted within said first arm part, said balls cooperate with said through holes of said first arm part when aligned to thereby lock said second arm part in place with respect to said first arm part into a number of selected positions.

16. The measurement apparatus according to claim 11, further comprising:

a plurality of annular grooves are formed on a surface of said measurement head; and

an end piece fitted to said second end of said second arm part and having a measurement through hole formed therein for receiving said measurement head therein, said end piece comprising a stub projecting axially out from said second end of said second arm part having a central hole for receiving a ball and spring assembly therein for cooperating with an annular groove of said measurement head, such that said measurement head is locked into position relative to said second arm part by a screw which presses said ball into said annular groove.

17. The measurement apparatus according to claim 11, wherein said second arm part further comprises:

a plastic end sleeve coupled to said first end thereof.

18. The measurement apparatus according to claim 11, wherein the first arm part further comprises:

end threads formed at a second end thereof for receiving a nut, whereby a tension sleeve disposed between said nut and said second arm part permits said second arm part to be locked into different positions with respect to said first arm part.--

REMARKS

The specification has been amended to include section headings at appropriate locations and to correct minor informalities.

The claims have been amended to remove multiple dependencies therefrom in order to reduce the filing fee and to correct minor informalities therein. In addition, new claims 11-18 have been added which are directed to embodiments of the invention disclosed in the original specification.

It is respectfully submitted that no new matter has been added.

Respectfully submitted,

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Equipment and method of measurement in vehicle body alignment work in vehicle body measurement

The invention relates to a measurement apparatus and method in vehicle body alignment work in measurement of a vehicle body.

The apparatus arrangement in accordance with the invention comprises a device for alignment of a vehicle body, which device includes an alignment table to which a vehicle is attached by means of fastenings. The construction advantageously comprises a lifting gear, by means of which the alignment table can be raised to a desired alignment level. The tools to be coupled with the vehicle, such as pulling ropes or chains, can be connected to the alignment table, preferably by means of straightening booms or equivalent. The apparatus arrangement in accordance with the invention comprises a measurement apparatus that can be fitted around the vehicle to be aligned. The measurement apparatus comprises longitudinal guides on whose support a measurement arch and the measurement units associated therewith can be displaced. Perpendicularly to the centre lines X_1 of the longitudinal guides there is a transverse guide or transverse guides, which can be displaced along the longitudinal guide, having received their control from the longitudinal guide, in order to measure the constructions at the bottom of the vehicle. Said transverse guides also act as structural components interconnecting the longitudinal guides.

For the time of measurement, the vehicle is placed on the alignment table and attached to the table from the fastenings, preferably skirt fastenings or equivalent. Onto the alignment table, the measurement apparatus is fitted so that the longitudinal guides of the measurement apparatus are placed on support of the ends of the transverse beams of the alignment table, which beams are perpendicular to the longitudinal axis (X-axis) of the alignment table.

The transverse guides or beams interconnecting the longitudinal guides operate as guides for the lower measurement units connected with them. The measurement arch, and there can also be several arches, comprises a measurement unit, which can be displaced to different positions in the guides provided on the vertical beam of the measurement arch. The measurement head of the measurement unit can be displaced so that it extends to the vehicle to be aligned, placed in the middle of the measurement arch. The measurement unit of the measurement device comprises an elongated arm, which can be displaced to a desired measurement position, and the measurement value can be read from a display of an electric PC apparatus or manually from reading bars on the guides.

In accordance with the invention, a new type of measurement arrangement has been provided which is based on the use of a measurement unit that comprises a measurement arm to whose end separate arm parts are connected by means of an articulation, a measurement head being connected to the end of said arm parts. The first arm part can be moved with respect to the measurement arm in a horizontal plane and the second arm part can be turned around its longitudinal axis. Moreover, the measurement head can be positioned in different linear positions with respect to the second arm part. Advantageously, the second arm part is also movable to different linear positions with respect to the first arm part. Thus, the measurement head is provided with several different degrees of freedom, and it can also be brought to measurement points inside a vehicle. In accordance with the invention, the first arm part can be pivoted in the articulation with respect to the measurement arm such that it is locked in a given position, for example, with an angular spacing of 45°. A similar arrangement is provided for rotating the second measurement arm. The second measurement arm can be rotated around its axis preferably with a spacing of 90° so that desired locking positions are obtained with a spacing of 90°. Similarly, the measurement head can be positioned in different linear positions and also locked in a desired linear position. Said positions of the arms and of the measurement head are set in advance and they can be programmed directly into the memory of a microprocessor or a computer, thereby allowing the measurement result associated with each combination of the measurement arm positions to be obtained directly

from the computer or the microprocessor. In that case, a measurement record can also be printed immediately.

Characteristic features of the measurement apparatus and method in accordance with the invention are set forth in the claims.

The invention will be described in the following with reference to some preferred embodiments of the invention illustrated in the figures of the accompanying drawings, to which embodiments the invention is, however, not intended to be exclusively confined.

Figure 1A is a side view of a device for alignment of a vehicle A.

Figure 1B shows the alignment device shown in Fig. 1A viewed from above.

Figure 2A shows a measurement device comprising a measurement frame fitted on an alignment table. Centring of the measurement device in compliance with the centre line of the vehicle is shown, and, as shown in the figure, support arms in accordance with the invention are fitted between the measurement frame and the vehicle.

Figure 2B shows the apparatus in accordance with the invention viewed from above, four support arms being arranged to be coupled with the vehicle to be aligned.

Figure 2C is a sectional view taken along the line I—I in Fig. 2B.

Figure 2D illustrates the apparatus arrangement shown in Fig. 2C as viewed in the direction of the arrow k_1.

Figure 3A shows a measurement system in accordance with the invention in which a measurement head 64 is connected to a measurement arm 40 through an articula-

tion 41 and arms 42 and 43. The figure illustrates the measurement device arrangement in accordance with the invention.

Figure 3B is a so-called exploded view of the measurement apparatus of the invention connected to the measurement arm.

Figure 3C shows holes situated in an end face 44b of a sleeve 44, a ball/balls being positioned in said holes in locking positions.

Figure 3D is a cross-sectional view of the arm 42. It shows holes situated with an angular spacing of 90°, balls being positioned in said holes in a locking situation.

Figure 4 illustrates measurements carried out by means of the apparatus in accordance with the invention. The measurements are denoted with reference numerals 1, 2 ... and 5.

Figures 5A—5E show on an enlarged scale the measurement points shown by numerals 1—5 in Fig. 4.

As shown in Fig. 1A, the vehicle alignment device comprises an alignment table 10 shown in the figure, which table can be raised and lowered by means of a scissor jack 13 with respect to a base frame 12. The alignment device comprises transverse beams $11b_1$,$11b_2$,$11b_3$ and $11b_4$ provided in its alignment table 10, on which beams fastenings $11a_1$,$11a_2$... have been disposed, so that the vehicle to be aligned can be attached to the alignment table by means of the fastenings.

Fig. 1B shows the apparatus arrangement of Fig. 1A viewed from above. The alignment table 10 comprises longitudinal beams and the transverse beams $11b_1$, $11b_2$,$11b_3$ and $11b_4$ connected with them. The transverse beams are provided with the fastenings $11a_1$,$11a_2$,$11a_3$ and $11a_4$, from which the vehicle can be attached to the alignment table 10 for the time of alignment of the vehicle. The aligning can be carried out in the figure by means of pulling ropes or chains or similar tools, in

which connection the alignment force can be applied, for example, by means of the pulling rope or chain, for example, through a straightening boom connected with the alignment table, to the area to be straightened on the vehicle.

Fig. 2A shows a measurement device 15 as fitted on support of the alignment table 10. The measurement device 15 comprises longitudinal guides $15a_1$,$15a_2$, preferably beam constructions, which are placed horizontally parallel to the longitudinal axis X of the vehicle A. Perpendicularly to the centre lines X_1 of the longitudinal guides, there are transverse guides $16a_1$,$16a_2$..., preferably also beams, on which measurement units $17a_1$,$17a_2$... can be placed.

In connection with the longitudinal guides $15a_1$ and $15a_2$, a measurement arch 15b (one or more) can be placed, which comprises vertical beams $15b_1$,$15b_2$, preferably vertical guides, in which the measurement unit $17a_1$,$17a_2$ is arranged to be movable in a vertical direction. The measurement unit $17a_1$,$17a_2$ of the measurement device 15 further comprises a measurement arm 40 connected with said unit and displaceable with respect thereto in a horizontal plane, and a measurement head 65 in said arm. The measurement arch 15b comprises a connecting beam $15b_3$ that connects the vertical beams, i.e. the vertical guides $15b_1$ and $15b_2$ from the top. After the measurement apparatus 15 has been centred in compliance with the centre line (O-line) of the vehicle A, the vehicle can be measured at desired points by means of the measurement units $17a_1$,$17a_2$ situated in connection with the measurement arch 15b mounted on the longitudinal guides $15a_1$,$15a_2$ and, similarly, by means of the displaceable measurement units $17a_3$,$17a_4$ provided on the transverse guides.

As shown in Fig. 2A, in accordance with the invention, a device 20 for fastening the measurement apparatus 15, preferably a support arm, is disposed between the vehicle A to be aligned and the measurement apparatus 15. Preferably, there are two fastening devices 20, preferably support arm constructions, on either side of the vehicle A. Favourably, the supporting of the measurement device on the vehicle A is carried out by means of said support arms 20 such that two support arms 20 are

supported on one transverse beam or guide $16a_1$,$16a_2$. On each side of the vehicle, one support arm 20 is supported on the vehicle from the transverse beam $16a_1$, $16a_2$... Preferably, the supporting is carried out such that the support arm is tensioned between the transverse beam $16a_1$,$16a_2$... of the measurement device 15 and the vehicle A to be straightened, which vehicle has been attached to the alignment table 10 at the fastenings $11a_1$,$11a_2$...

Fig. 2B illustrates the apparatus in accordance with the invention viewed from above. The transverse guides $16a_1$,$16a_2$, which comprise the displaceable measurement units $17a_3$,$17a_4$ (in Fig. 2A) placed on them, are disposed between the longitudinal guides $15a_1$ and $15a_2$. The transverse guides $16a_1$ and $16a_2$ are guided in the longitudinal guides $15a_1$,$15a_2$. The measurement arch 15b is also guided in the longitudinal guides $15a_1$ and $15a_2$. Also, the measurement units $17a_3$,$17a_4$ are guided in the transverse guides $16a_1$,$16a_2$. As shown in the figure, four fastening devices 20 are arranged to support the measurement frame of the measurement apparatus 15 on the vehicle A. Preferably, between the measurement apparatus 15 and the vehicle, there is a fastening device which comprises a support arm that can be tensioned between the vehicle A and the measurement apparatus 15.

Fig. 2C is a cross-sectional view taken along the line I—I in Fig. 2B at a longitudinal guide and a transverse guide. As shown in Fig. 2C, the transverse guide $16a_1$ comprises bearing means 16b which always keep the longitudinal axis y of the transverse guide $16a_1$ perpendicular to the longitudinal axes X_1 of the longitudinal guides $15a_1$,$15a_2$. As shown in Fig. 2C, the data on the position of the measurement arch 15b are read by using a detector 30 shown in the figure, which detector comprises a stepping motor 31 and an associated cogged wheel 32, which is in engagement with teeth 33 provided along the length of the longitudinal guide. When the measurement arch 15b has been positioned and calibrated initially in a certain position, the stepping motor 31 indicates the distance of shifting apart from the calibration point through a converter to a PC and further to a display. The measurement arch 15b is mounted by means of a wheel U_1 in a guide groove U_2 in the guide $15a_1$. Similarly, the measurement unit $17a_1$,$17a_2$ comprises detector means

which indicate the feed-out position of the measurement arm 40 and the height position of the measurement unit $17a_1$ in the vertical guide $15b_1$,$15b_2$.

Fig. 2D illustrates the apparatus viewed in the direction of the arrow K_1 in Fig. 2C, i.e. from above. The transverse guide $16a_1$,$16a_2$... comprises a plate part 16d situated at its ends perpendicularly to its bridge beam 16c, which plate part 16d includes a number of bearings 16b, which are fitted in said plate part 16d and arranged to travel along with the plate part in a longitudinal guide groove U_3 in the longitudinal guide $15a_1$.

Fig. 3A illustrates the apparatus in accordance with the invention in different positions of a pivotable arm 42. The first arm part 42 is connected to the measurement arm 40 by means of an articulation 41, a second arm part 43 being further connected to said first arm part. A measurement head 64 is connected to the second arm part 43. The measurement head 64 is brought into contact with the point to be measured. As shown in the figure, the arm part 42 can be turned by means of the articulation 41 to different locking positions, advantageously to different locking positions with an angular spacing of 45°. Similarly, the second arm part 43 can be rotated around its longitudinal axis X_{30} to different angular positions/locking positions. Advantageously, there are such angular/locking positions with an angular spacing of 90°. The arm part 42 is arranged to pivot in a horizontal plane. The measurement arm 40 is moved as shown by the arrow S_1 with respect to the measurement unit $17a_1$ which measures the exact feed-out position of the measurement arm 40. The height position of the measurement unit $17a_1$ in the vertical guide $15a_1$ is also measured by the detector means of the measurement unit $17a_1$. Moreover, the vertical guide $15a_1$ can be placed in different positions with respect to the longitudinal axis X of the vehicle on the side of the vehicle. Said angular position can be measured separately, as shown in the embodiment of Fig. 2C.

Each part of the mechanism has its own locking position. Thus, when storing in the memory of a computer the positions of the arm part 42 or the second arm part 43 following after it and of the associated measurement head 64, the position of the tip

of the measurement head can immediately be calculated by means of a program stored in the memory of the computer. Thus, the measurement result related to a given combination of positions can be read directly from a display of the computer and/or printed from a printer of an output device as a measurement record.

In accordance with the invention, it is also possible to use a device arrangement in which detector means detect, at a given time, the locking position of each part, such as the arm part 42, the second arm part 43 and the measurement head 64, and the data in question are electrically supplied directly into the memory of the computer which indicates a reading of the measurement head corresponding to the combination detected.

Fig. 3B shows the measurement arm 40 associated with the measurement apparatus in accordance with the invention comprising the articulation 41 at its end. The longitudinal axis of the measurement arm 40 is designated by X_{10}. The arm part 42 is connected to the measurement arm 40 through the articulation 41. The arm part 42 is a hollow structure and includes an inner space D which is closed by a cover 42a at one end. The longitudinal axis of the arm part 42 is designated by X_{20}. The arm part 43 is connected to the first arm part 42. Said second arm part 43 can be turned around its longitudinal axis X_{30}. The measurement head 65 can be passed through a through hole 64 in the second arm part 43. Thus, the tip J, or the reading head, of the measurement head 65 has several degrees of freedom. The measurement head 65 can be displaced linearly in the direction of its longitudinal axis X_{40}, which axis X_{40} is perpendicular to the axis X_{30}. The geometric longitudinal axis of the through hole 64 is perpendicular to the axis X_{30}. To begin with, the tip J can be raised and lowered in the vertical guides of the measurement arch and moved in the longitudinal or horizontal guides to different positions with respect to the longitudinal axis X of the vehicle. In addition, the measurement arm 40 can be moved in the direction of its longitudinal axis X_{10} to different positions towards and away from the vehicle. The first arm part 42 can be pivoted with respect to the articulation 41 such that the arm part 42 turns in the horizontal plane to different angular positions. A backing body 48 and the associated arm part 42 can be pivoted around a geomet-

ric axis Y_1, which axis Y_1 is perpendicular to the longitudinal axis X_{10} of the measurement arm 40. Advantageously, there are several angular positions with a spacing of 45°. In addition, the second arm part 43 can also be turned around its longitudinal axis X_{30} preferably with an angular spacing of 90°. Furthermore, the measurement head 65 can be positioned linearly in the direction of its axis X_{40} to different positions with respect to the second arm part 43.

The articulation 41 is formed of a sleeve 44 comprising a hollow inner space E. At the end of the sleeve 44 there is a cover 44a which closes the inner space E. On an end face 44b of the sleeve 44 there are situated holes $45a_1$,$45a_2$,$45a_3$... with a spacing of 45° or another regular number of degrees. Balls $46a_1$,$46a_2$... which are arranged to be pressed by springs $47a_1$,$47a_2$ are situated in holes $49a_1$,$49a_2$... of the backing body 48. Thus, the backing body 48 can be pivoted to a desired angular position with respect to the sleeve 44, which sleeve 44 is firmly attached to the measurement arm 40. A fixing bolt 50 is passed through a hole 48c provided in the pivotable backing body 48 and further through a hole 44c of the sleeve 44, and thus a nut 52 presses the backing body 48 against the end face 44b of the sleeve 44. The balls $46a_1$,$46a_2$... remain between the end face 44b of the sleeve 44 and an end face 48b of the backing body 48. The desired adjustment force for pivoting the backing body 48 is regulated by adjusting the tension of the nut 52 with the screw 50. The angular spacing of the holes $45a_1$,$45a_2$... determines the accuracy of adjustment. Advantageously, the angular spacing of the holes $45a_1$,$45a_2$... is 45°.

Screws $53a_1$ and $53a_2$ fasten the arm part 42 to the backing body 48. The screws $53a_1$,$53a_2$ are passed through the wall of the arm part 42 and their heads are thus situated in the inner space D of the arm part 42. The cover 54 closes the hollow inner space D of the arm part 42.

The first arm part 42 after the articulation 41 comprises first holes $55a_1'$,$55a_1$...; $55a_2'$,$55a_2$... in pairs, which holes in pairs are preferably provided with an angular spacing of 90°, and the holes have been made through the wall of the first arm part 42. Said first holes $55a_1'$;$55a_1$ are situated at the end of the arm part 42 on the side

of the articulation 41, and second holes $56a_1', 56a_1$; $56a_2', 56a_2$... in pairs, also with an angular spacing of 90°, are situated at the other end of the arm part 42. The arm part 42 additionally comprises at its end a tapering end thread 57 with a nut 59 placed onto it, a tension sleeve 58 being situated between the nut 59 and the second arm part 43.

As shown in Fig. 3B, the second arm part 43 is placed in the inner space D of the first arm part 42 as shown by the arrow L_1 such that springs $61a_1$, $61a_2$ and balls $62a_1, 62a_2$... situated in holes $60a_1', 60a_1$; $60a_2', 60a_2$... at the end of the second arm part 42 will be cooperative with the holes $55a_1', 55a_1$; $55a_2', 55a_2$ ... or $56a_1', 56a_1$... of the first arm part 42. The springs $61a_1$ and $61a_2$ and the balls $62a_1, 62a_2$... are cooperative with the holes $56a_1', 56a_1, 56a_2', 56a_2$ or with the holes $55a_1', 55a_1$; $55a_2'$, $55a_2$ at either end of the first arm part 42, i.e. the first arm part can be placed by a linear movement L_1 to alternative length positions with respect to the first arm part 42. The balls $62a_1, 62a_2$... are preferably situated on the opposite sides of the arm 43, in their holes $56a_1', 56a_1$..., into which the springs $61a_1, 61a_2$... are placed.

The end of the second arm part 43 advantageously includes an end piece 600, which is a plastic part placed at its shoulder to the end of an arm part 430 proper which is made of metal. By using a plastic part, advantageous bearing properties are imparted to the balls, and there is no need for lubrication. The sleeve 600 is preferably attached by a cotter 63 to said metal portion 430 of the second arm part 43.

An end piece 700 is connected to the metal portion 430 at the other end of the second arm part 43, said end piece 700 comprising a through hole 64 whose centre axis is perpendicular to the longitudinal axis X_{30} of the second arm part 43 and through which through hole 64 the measurement head 65 is passed. The measurement head 65 comprises grooves $66a_1, 66a_2$... in spaced relationship with one another. Further, the structure comprises an end stub 67 into whose inner hole 68 a ball 69 and a spring 70 are placed. A screw 71 is arranged to press the spring. The force by which the spring 70 presses the ball 69 against one of the grooves $66a_1$ or $66a_2$... in the measurement head 65 can be regulated by turning the screw 71. By

displacing the measurement head 65 in the through hole 64, the measurement head can be brought to alternative positions $66a_1$ or $66a_2$... A protective cover 72 is provided around the end stub 67. When needed, an extension arm can also be attached to the end stub 67.

As shown in Fig. 3C, the holes $45a_1$,$45a_2$... are situated with a angular spacing of 45° on the end face 44b of the sleeve 44. The balls $46a_1$,$46a_2$ are positioned in the holes $45a_1$,$45a_2$,$45a_3$... in a locking situation.

In the arrangement in accordance with the invention, the first arm part 42 can be displaced in a horizontal plane with respect to the measurement arm 40 by means of the articulation 41 to different locking positions which may be provided with a spacing of 45°. Similarly, the second arm part 43 connected to the first arm part 42 can be turned around its longitudinal axis to different angular and locking positions provided, for instance, with a spacing of 90°. Similarly, the measurement head 64 can be positioned linearly in different positions. Said position data can be programmed directly into the memory of a computer, and the precise position of the tip J of the measurement head 65 can be calculated geometrically by means of a program stored in the memory. Thus, when the different positions of the measurement arms 42,43 have been preprogrammed into the memory of the computer, the computer directly shows the measurement result related to said combination of the measurement arm positions on the display of the computer, and/or said measurement result can be printed directly as a measurement record.

In accordance with the invention, the first arm part 42 associated with the articulation 41 and the second arm part 43 connected to the first arm part as well as the measurement head 65 connected to the second arm part can also be provided with electrical means which indicate the positions of the arm parts 42,43 and the measurement head 65 directly to a computer, which stores them in the memory of the computer and further indicates the exact coordinates of the measurement tip J in three-dimensional space. Different position detectors may be used for indicating the

data on the position of the measurement head 64 of the arm parts 42 and 43 directly to the computer.

Fig. 3D shows the holes $56a_1$,$56a_2$ of the arm 42 into which the balls $62a_1$,$62a_2$... are pressed by the springs $61a_1$,$61a_2$ in any given locking situation. The holes are provided with an angular spacing of 90°, thereby enabling the arm 43 to have eight different locking positions when turning it around its longitudinal axis X_{30}.

Fig. 4 shows different measurement points of the measurement arm 40 in accordance with the invention in connection with a vehicle to be repaired. The measurement points are denoted with reference numerals 1,2,3,4 and 5 in the figure. Figs. 5A, 5B,5C,5D, and 5E are enlarged views of the corresponding points of the measurement head.

Fig. 5A shows angular measurement of a roof going on to ensure the correct dimensioning of window and door openings. Fig. 5B shows measurement of the attachment points for rear suspension in the interior of a car, which is made possible by the turning measurement head in accordance with the invention. Fig. 5C shows measurement of the upper end of suspension, which is one of the most important measurement points. Fig. 5D shows measurement of a vertical pillar, which often also includes measurement of the locations of bolts for fastening rear doors.

Fig. 5E shows measurement of the location of a bolt for fastening a lower support arm which affects the driving characteristics.

Claims

1. A measurement apparatus for vehicle body alignment work, which measurement apparatus can be placed in connection with an alignment table (10) to whose fastenings ($11a_1$,$11a_2$,$11a_3$,$11a_4$) the vehicle is attached for the time of the alignment work, and a measurement unit ($17a_1$,$17a_2$) of which measurement apparatus (15) can be moved in a vertical guide ($15b_1$,$15b_2$), which vertical guide ($15b_1$,$15b_2$) can further be moved in a longitudinal guide ($15a_1$,$15a_2$), and which measurement unit ($17a_1$) can be provided with a movable measurement arm (40), **characterized** in that the measurement arm (40) comprises an articulation (41) to which a first arm part (42) is connected such that the arm part (42) can be pivoted on support of the articulation (41) with respect to the measurement arm (40), and that to the arm part (42) is connected a second arm part (43) which can be turned around its longitudinal axis (X_{30}), to which second arm part (43) a measurement head (65) is connected either directly or through an intermediate part.

2. A measurement apparatus for vehicle body alignment work as claimed in claim 1, **characterized** in that a second structure formed by the arm parts (42,43) can be extended in the direction of the longitudinal axis (X_{20}) of the arm part (42) such that the second arm part (43) can be displaced with respect to the first arm part (42) to different length positions.

3. A measurement apparatus as claimed in any one of the preceding claims, **characterized** in that the second arm part (43) comprises at its end a through hole (64) through which the measurement head (65) is passed perpendicularly to the longitudinal axis (X_{30}) of the second arm part.

4. A measurement apparatus as claimed in any one of the preceding claims, **characterized** in that the articulation (41) at the end of the measurement arm (40) comprises a sleeve part (44), a backing body (48) being pivotable with respect to the sleeve part (44) to alternative angular positions such that the backing body (48) comprises at its end face (48b) holes ($49a_1$,$49a_2$...), and that the sleeve (44) placed

against it comprises at its end face (44b) holes ($45a_1$,$45a_2$,$45a_3$), into which balls ($46a_1$,$46a_2$...) are positioned in locking positions, and that the balls ($46a_1$,$46a_2$) and springs ($47a_1$,$47a_2$) pressing the balls are placed into the holes ($49a_1$,$49a_2$...) of the backing body (48), the backing body (48) being pivotable to a desired angular position/locking position according to the spacing determined by the angular distance between the holes, and that the arm part (42) associated with the backing body (48) can be turned in a horizontal plane with respect to the measurement arm (40).

5. A measurement apparatus as claimed in any one of the preceding claims, **characterized** in that the first arm part (42) comprises at its both ends holes ($55a_1'$, $55a_1$; $55a_2'$,$55a_2$... $56a_1'$,$56a_1$;$56a_2'$,$56a_2$ ...), in which connection springs ($61a_1$, $61a_2$...) and balls ($62a_1$,$62a_2$) situated in holes ($60a_1'$,$60a_1$;$60a_2'$,$60a_2$) of the second arm part (43) can be brought alternatively either into the holes ($55a_1'$,$55a_1$...) of one end of the arm part (42) or into the holes ($56a_1'$,$56a_1$...) of the other end thereof, in which connection the balls ($62a_1$,$62a_2$...) can be turned through a desired angular spacing and they will be positioned alternatively in the holes ($55a_1'$,$55a_1$... or $56a_1'$,$56a_1$...) of the first arm part (42) in locking positions.

6. A measurement apparatus as claimed in any one of the preceding claims, **characterized** in that the second arm part (43) comprises an end piece (700) and therein a through hole (64) for the measurement head (65), and that the measurement head (65) comprises grooves ($66a_1$,$66a_2$), in which connection the measurement head (65) can be placed in alternative positions, the end piece (700) comprising an end stub (67) into whose inner hole (68) a ball (69) and a spring (70) are placed, a screw (71) pressing the ball (69) into one of the grooves ($66a_1$ or $66a_2$...) defined by the locking position of the measurement head (65).

7. A measurement apparatus as claimed in any one of the preceding claims, **characterized** in that the second arm part (43) comprises an end sleeve (600) at the end on the side of the first arm part (42), which end sleeve is attached by means of a cotter (63) to a metal portion (430) of the second arm part (43), and that the holes ($60a_1$,

60a$_1$,60a$_2$,60a$_2$) have been made into the end sleeve (600) made of plastic, thereby enabling good bearing properties for the balls (62a$_1$,62a$_1$...).

8. A measurement apparatus as claimed in any one of the preceding claims, **characterized** in that the first arm part (42) comprises end threads (57) at its end, onto which threads a nut (59) can be mounted, so that by means of a tension sleeve (58) situated between the nut (59) and the arm part (43) the arm part (43) can be locked to different positions with respect to the first arm part (42), the tension sleeve (58) being split in a longitudinal direction, thereby serving as a tension washer when the nut (50) tightens it against the arm part (43), the thread (57) being a taper thread.

9. A method in vehicle body alignment work in measurement of a vehicle body, which method employs a measurement apparatus (15) which is connected to an alignment table and which comprises guides (15a$_1$,15a$_2$) extending parallel to the longitudinal axis (X) of the vehicle as well as vertical guides (15b$_1$,15b$_2$), the vertical guides (15b$_1$,15b$_2$) moving in the longitudinal guides (15a$_1$,15a$_2$) and comprising a measurement unit (17a$_1$,17a$_2$) which can be moved in the vertical guides (15b$_1$,15b$_2$), and that the measurement unit (17a$_1$,17a$_2$) is provided with a movable measurement arm (40) which can be moved in a horizontal direction with respect to the measurement unit (17a$_1$), **characterized** in that the measurement apparatus used is such that it comprises at the end of the measurement arm (40) a movable first arm part (42) which moves in a horizontal plane, and that a second arm part (43) is connected to said arm part (42) which can be moved and positioned in a horizontal plane, said second arm part (43) being rotatable around its longitudinal axis (X$_{30}$), and that a measurement head (64) is connected to the second arm part (43), whereby, by using the arrangement in accordance with the invention, the measurement locations situated inside the vehicle body (A) can also be measured by the same measurement head (64).

10. A method as claimed in claim 9, **characterized** in that, in the method, the combination of locking positions of each arm part (42,43) and the measurement head (64) connected to the measurement arm (40) is read and fed into the memory of a

computer or said combination is detected electrically by using position detectors which indicate the pivot position of the arm part (42), the rotation position of the second arm part (43) connected to the first arm part (42) and the linear position of the measurement head (64) connected to the second arm part (43), and that, based on said data fed or directly electrically detected, the result of measurement is directly indicated on the display of the computer or equivalent and/or said measurement result is printed as a measurement record.

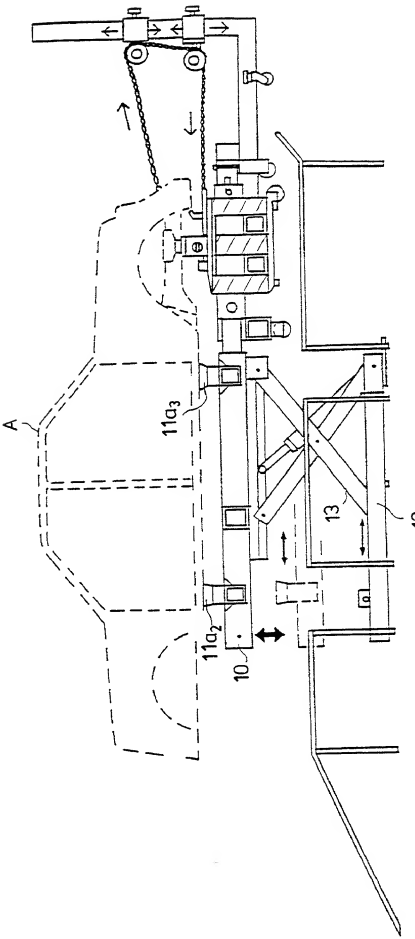


FIG. 1A

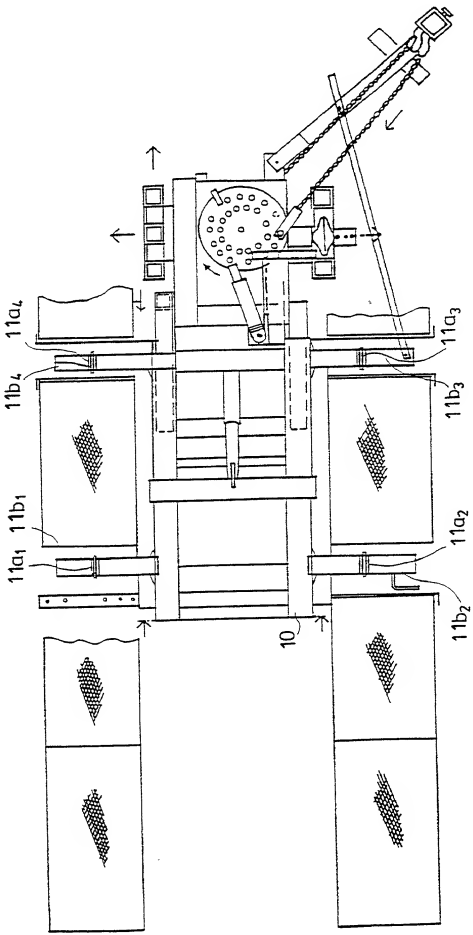


FIG. 1B

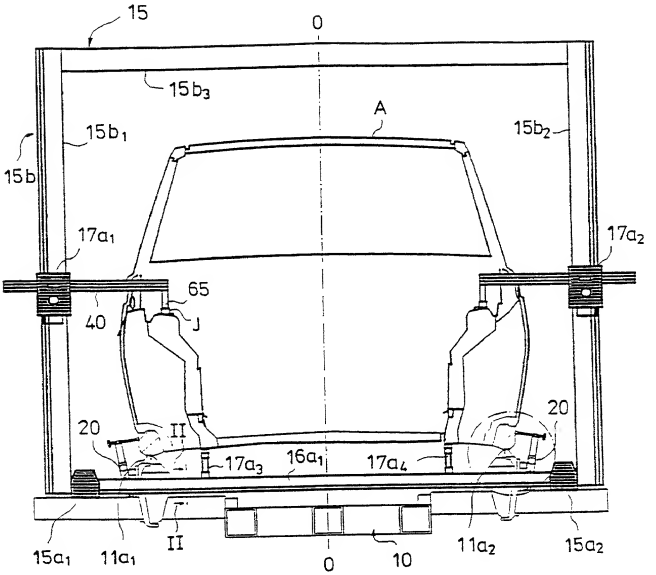

15
0
15b3
A
15b1
15b2
15b
17a1
17a2
65
40
J
20
20
II
17a3
16a1
17a4
15a1
11a1
II
0
10
11a2
15a2

FIG. 2A

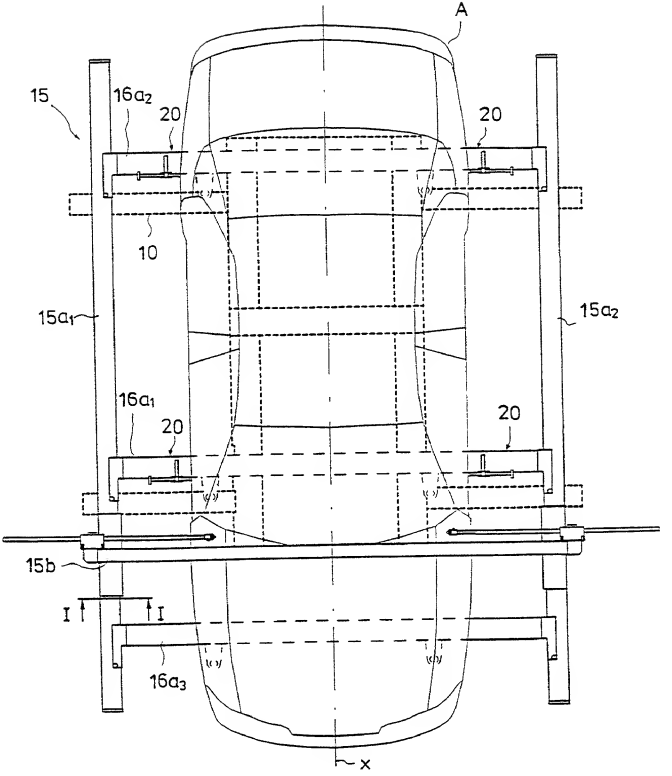


FIG. 2B

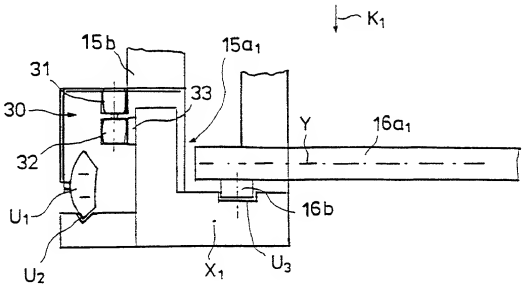

K1
15b
15a1
31
33
30
Y
16a1
32
U1
16b
U2
X1
U3

FIG. 2C

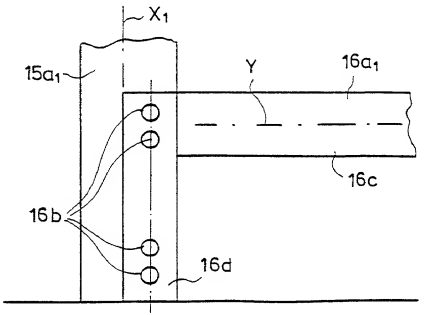

X1
15a1
Y
16a1
16c
16b
16d

FIG. 2D

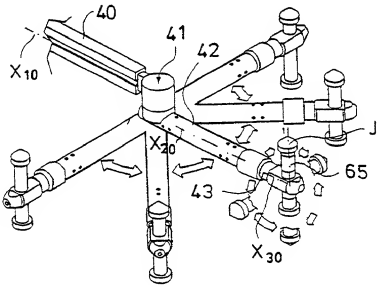


FIG. 3A

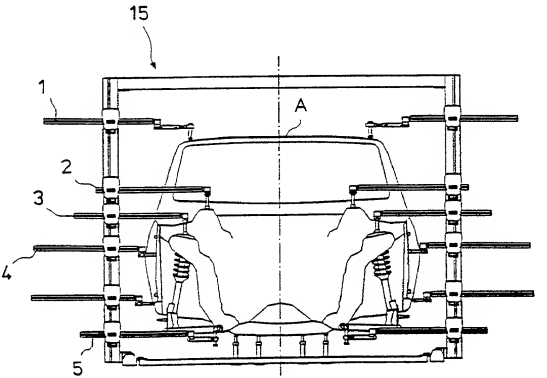
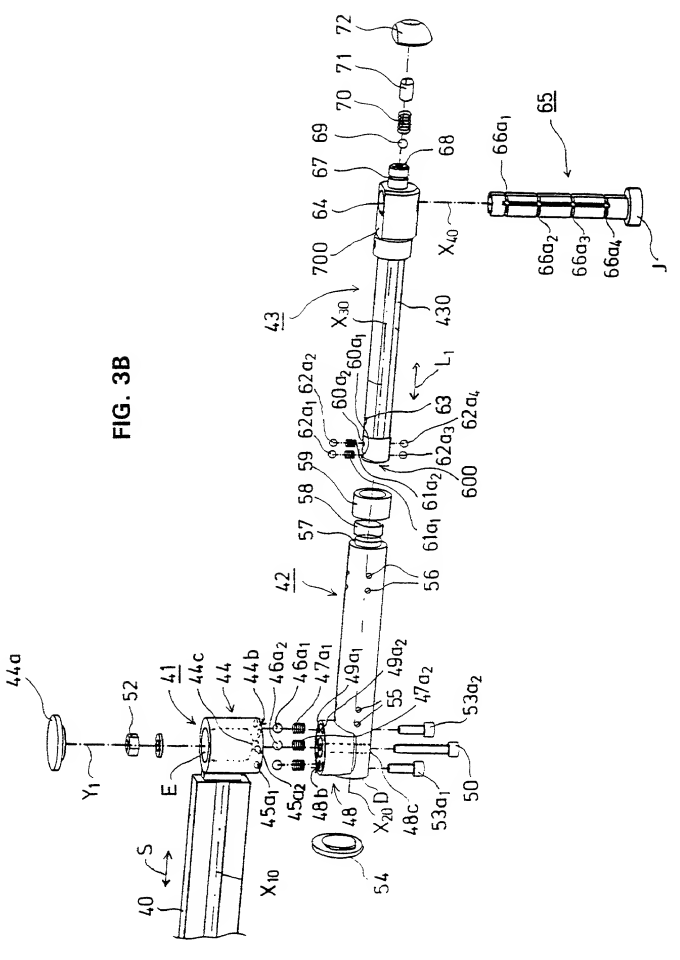


FIG. 4


72
71
70
69
67
64
700
43
X30
60a1
60a2
62a1
62a2
59
58
57
42
56
61a1
61a2
600
62a3
62a4
63
L1
430
68
66a1
65
X40
66a2
66a3
66a4
J
44a
52
41
44c
44
44b
46a2
46a1
47a1
49a1
55
49a2
47a2
53a2
Y1
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48b
48
54
X20
D
48c
53a1
50
S
40
X10

FIG. 3B

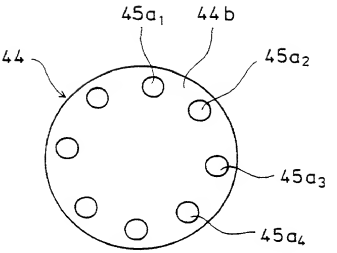

FIG. 3C

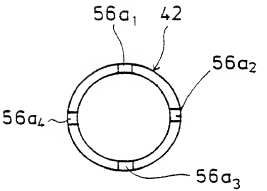

FIG. 3D

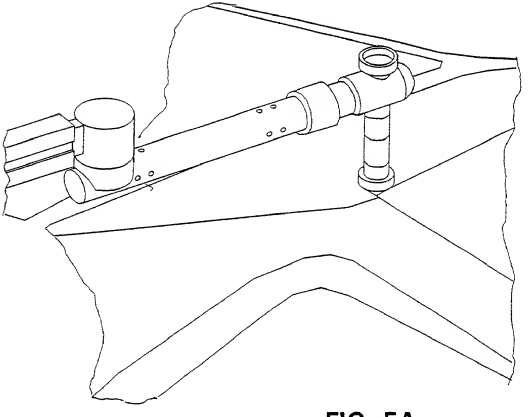

FIG. 5A

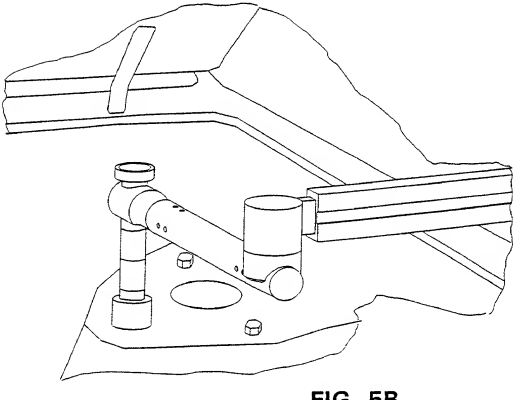

FIG. 5B

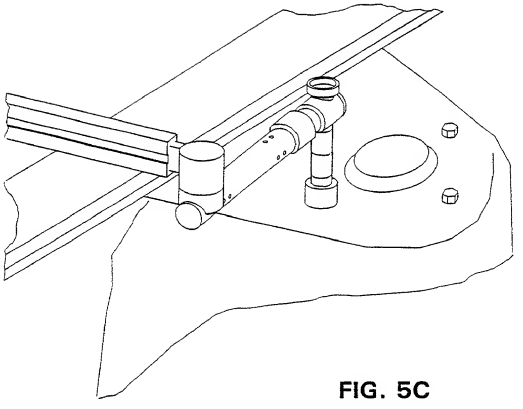

FIG. 5C

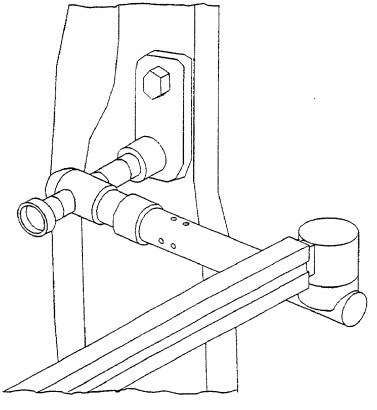

FIG. 5D

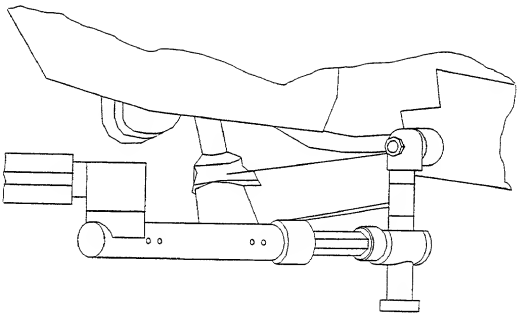

FIG. 5E

Docket No.: 991.1145

U.S.A.
DECLARATION AND POWER OF ATTORNEY

As the below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: **Equipment and method of measurement in vehicle body alignment work in vehicle body measurement**

the specification of which (check one)
__X__ is attached hereto.
_____ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable). I Hereby authorize and request my attorney, Steinberg & Raskin, P.C. of 1140 Avenue of the Americas, New York, New York 10036 to insert the filing date and application number when known.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is known to us to be material to the patentability of this application as defined in Title 37, Code of Federal Regulations §1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 of any foreign and/or provisional application(s) for patent or inventor's certificate listed below and have also identified below any foreign and/or provisional application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR APPLICATION(S)			Priority claimed
981125	**Finland**	**May 20, 1998**	**X** Yes / No

I Hereby claim the benefit under Title 35, United States Code, §120 of any United States applications(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/FI99/00421	**May 17, 1999**	**pending**

And I hereby appoint

Martin G. Raskin, Registration No. 25,642,
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my attorneys, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith; correspondence address:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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